P-752

Piezo NanoAutomation® Stages with Direct Metrology

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P-752.11C NanoAutomation® Stage

- **Ultra-Fast Response**
- **Ultra-Precise Trajectory Control**
- **Digital Controllers with Fast FiberLink Interface Available**
- **ID-Chip for AutoCalibrate Function**
- **Direct-Metrology Capacitive Sensors for Highest Precision**
- **0.1 nm Resolution**
- **PICMA® High-Performance Piezo Drives**

P-752 series high-speed nanopositioning stages are extremely precise devices, providing a positioning and scanning range up to 30 µm with very rapid settling time and extremely low tip/tilt errors. These stages were specially designed for high-speed dithering and disk drive testing applications. They are equipped with capacitive sensors providing sub-nanometer resolution and stability.

Application Examples

- Disk drive testing
- FBG writing (fiber bragg gratings)
- Metrology
- Nanopositioning
- Scanning microscopy
- Fiber optics
- Scanning interferometry
- Biotechnology
- Micromanipulation

Nanometer Precision in Milliseconds

The direct-drive design, together with careful attention to mass minimization, results in significant reduction in inertial recoil forces applied to the supporting structures, enhancing overall system response, throughput and stability. In combination with the E-612 controller, a 15 µm stage with a 300 g load settles to better than 0.1% in 17 msec—making it significantly faster and more precise than other systems.

AutoCalibration

For optimized operation and interchangeability of nanomechanisms and controllers, the P-752.xCD models are equipped with an ID-chip which holds all calibration data and sends it to the digital controller (e.g. E-750.CP). P-752.x1C models can be used with either analog or digital controllers.

Superior Accuracy Through Direct-Motion Metrology with Capacitive Sensors

P-752 stages are equipped with absolute-measuring, direct-metrology capacitive sensors. These sensors make possible motion linearity to 0.03% with effective resolution in the sub-nanometer range. They boast high bandwidth and exhibit no periodic errors.
Unlike conventional sensors, capacitive sensors measure the actual distance between the fixed frame and the moving part of the stage. They detect errors contributed by all components in the drive train—from the actuator through the flexures to the platform. This results in higher motion linearity, long-term stability, phase fidelity, and—because external disturbances are seen by the sensor immediately—a stiffer, faster-responding servo-loop. See p. 2-4 *ff.* and p. 5-2 *ff.* for more information.

Dynamic Digital Control for Best Scanning Linearity

Use our new digital control electronics with DDL (Dynamic Digital Linearization) to increase linearity and effective bandwidth in scanning applications by up to 1000-fold (see p. 6-16).

Working Principle / Reliability

P-752 stages are equipped with the award winning PICMA® piezo drives, integrated into a sophisticated flexure guiding system. The wire-EDM-cut flexures are FEA modeled for zero stiction, zero friction and exceptional guiding precision. The ceramic-encapsulated PICMA® drives are more robust than conventional piezo actuators, featuring superior lifetime and performance in both dynamic and static applications.
Because guidance, actuators and sensors are all frictionless and maintenance-free, these nanopositioning systems achieve outstanding levels of reliability.

Ordering Information

P-752.11C
Piezo NanoAutomation® Stage, 15 µm, Capacitive Sensor, Lemo Connector

P-752.21C · P-752.11C
Piezo NanoAutomation® Stage, 30 µm, Capacitive Sensor, Lemo Connector

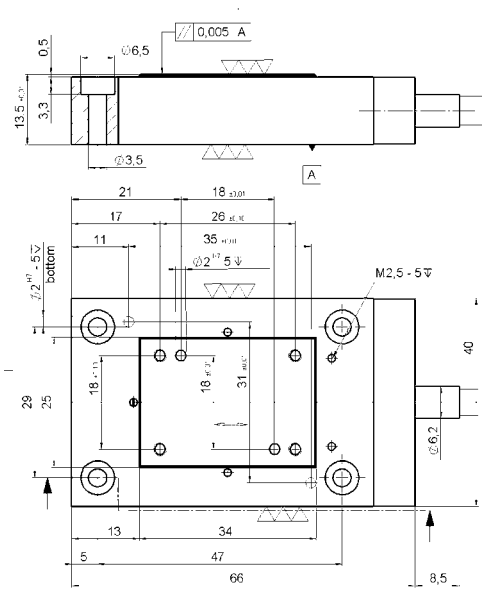
P-752.1CD · P-752.11C
Piezo NanoAutomation® Stage, 15 µm, Capacitive Sensor, sub-D Connector

P-752.2CD · P-752.11C
Piezo NanoAutomation® Stage, 30 µm, Capacitive Sensor, sub-D Connector

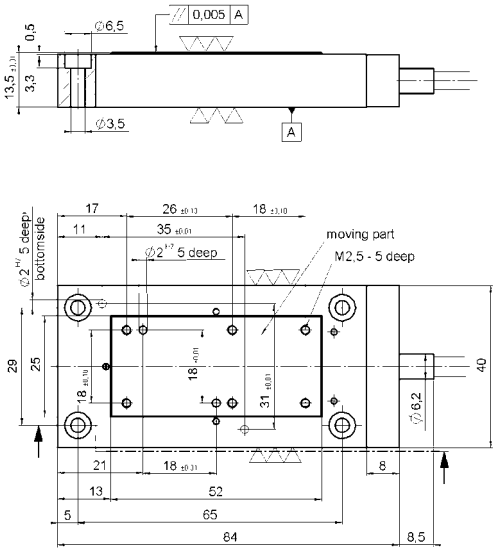
Ask about custom designs!

Notes

See the "Piezo Drivers & Nanopositioning Controllers" section, p. 6-8 *ff.* for our comprehensive line of low-noise control electronics.
See the "Selection Guide" on p. 2-14 *ff.* for comparison with other nanopositioning systems.



P-752.11C dimensions (in mm)

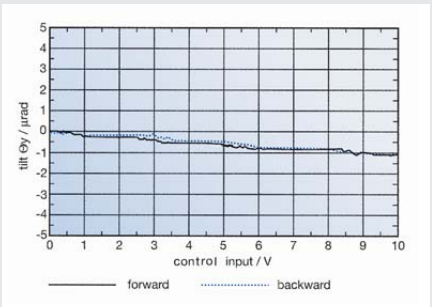


P-752.21C dimensions (in mm)

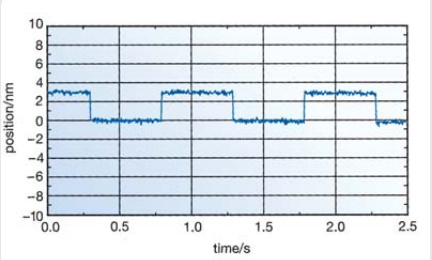
Technical Data

Models	P-752.11C P-752.1CD	P-752.21C P-752.2CD	Units	Notes see p. 2-84
Active axes	X	X		
Open-loop travel @ 0 to 100 V	20	35	µm ±20%	A2
Closed-loop travel	15	30	µm	A5
Integrated feedback sensor	capacitive	capacitive		B
* Closed-loop / open-loop resolution	0.1 / 0.1	0.2 / 0.2	nm	C1
Closed-loop linearity (typ.)	0.03	0.03	%	
Full-range repeatability (typ.)	±1	±2	nm	C3
Stiffness	30	20	N/µm ±20%	D1
Push/pull force capacity (in operating direction)	100 / 10	100 / 10	N	D3
Max. (±) normal load	30	30	N	D4
Lateral force limit	30	30	N	D5
Tilt (θ_Y, θ_Z) (typ.)	1	1	µrad	E1
Electrical capacitance	2.3	3.8	µF ±20%	F1
** Dynamic operating current coefficient (DOCC)	18	16	µA/ (Hz x µm)	F2
Unloaded resonant frequency	3200	2100	Hz ±20%	G2
Resonant frequency @ 300 g load	980	600	Hz ±20%	G3
Operating temperature range	-20 to 80	-20 to 80	°C	H2
Voltage connection	VL***	VL***		J1
Sensor connection	2 x C***	2 x C***		J2
Weight (with cables)	250	350	g ±5%	
Body material	N-S	N-S		
Recommended amplifier/controller (codes explained p. 2-17)	H, F, L	H, F, L		

* For calibration information see p. 2-8. Resolution of PI piezo nanopositioners is not limited by friction or stiction. The value given is noise equivalent motion with E-503 amplifier.
** Dynamic Operating Current Coefficient in µA per Hz and µm. Example: Sinusoidal scan of 10 µm at 10 Hz (P-752.11C) requires approximately 1.8 mA drive current.
*** .xCD versions with sub-D connectors



Typical 0.5 µrad bidirectional trajectory repeatability (P-752.11C stage) means processes may be performed bidirectionally for twice the productivity.



Response of a P-752.11C to a square wave control signal shows true sub-nm positional stability, incremental motion and bidirectional repeatability (measured with E-501 & E-503.00 & E-509.C1 controller, bandwidth set to 240 Hz).